

NATURAL GAS FED PC25C FUEL CELL POWER PLANT

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Covering Field Experience

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ABSTRACT

This report details the performances obtained during the first sixteen months of operation by the Natural Gas Fed PC25C™ Power Plant installed in the city of Saarbrücken (Germany).

The Owner of the Power Plant is the Stadtwerke Saarbrücken AG, the Municipal energy service company of the city which supplies the regional capital Saarbrücken (200.000 inhabitants) with electricity, long distance heat, natural gas and water.

The power plant has been installed and maintained by Erdgas Energie Systeme a gas company located in Essen. This company is also involved in operations of other PC25 power plants in Germany.

Information is provided on the resulting electrical and thermal performances, reliability and Mean Time Between Failure factors.

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1. EXECUTIVE SUMMARY

The fuel cell power plant , which is the first to be installed in Europe in May 1997, is a part of a series of innovative projects by the Stadtwerke Saarbrücken where future oriented technologies are tried out regarding their practical suitability for energy supply operation.

The PC25C of Stadtwerke Saarbrücken AG is connected to the low distance heating network of a housing estate for supplying heat. The maximum heat load is approximately 1000 KW with a heat demand of around 1200MWh/a; the 70% of this heat demand is supplied by the fuel cell.

The fuel cell is adjusted according to the heat load in the low distance heating network in a power range of between 100-200 KWel. The set point for the electrical power output is external, coming from a computer.

2. INTRODUCTION

Benefits of electrochemical energy conversion from PC25C phosphoric acid fuel cell power plants are:

- ? very low pollutant emission
- ? relatively high efficiency in the sub-megawatt range
- ? low noise and vibration
- ? potential for longer time between scheduled and unscheduled shutdown maintenance than engine driven system
- ?? ability to perform scheduled quarterly maintenance while the power plant is operating
- ?? high quality power

World PC25 fleet has exceeded 2 millions operating hours demonstrating the performance availability of such power plant.

PC25 power plants are installed in USA, Europe and Asia and fuels presently suitable for use by the phosphoric acid fuel cell include natural gas or propane, and hydrogen. Units have also successfully operated on municipal sewage treatment plant digester gas.

3. RESULT AND DISCUSSION

The values of the parameters indicated afterwards are related to the first operating year (May 1997-September 1998).

Mean Time Between Failure = 1611 hours
Total load time = 9668 hours

The thermal output was up to: 1200 MW/h
The electrical output was up to: 1379 MWh

The load of the power plant in Saarbrücken is controlled by the heat demand. Since the neighborhood is not completely connected to the hot water system yet the power plant is running most of the time between 100 and 150 KW.

4. CERTIFICATION

CLC S.r.l., Erdgas Energie Systeme and Stadtwerke Saarbrücken certify that it has complied in all respects with the grant under DE-FG21-96MC33362, Climate Change Fuel Cell Program and that the related efforts required by that grant are now fully complete including twelve months of operation and submission of the Final Report herein supplied. Such report is in compliance with Paragraph 4 of DoE's Special Terms and Conditions for Research Projects Grants for Climate Change Fuel Cell Program.

5. CONCLUSIONS

As explained in Chap. 3 the value of MTBF for this power plant has obtained a very good result.

In fact 1600 hours value represents a significant target showing the maturity of this technology.

Particularly promising applications are:

- ?? Hospitals and health care facilities and generally the buildings having favorable thermal recovery potentials and where at least some importance is attached to power quality and reliability.
- ?? Selected or isolated locations having grid capability constraints where long, expensive, or time-consuming capacity upgrades are otherwise required.
- ?? Data centers, communication facilities, and manufacturing plants where power quality and grid reliability are of particular concern.

For these reasons, dispersed generation locations at hospitals, computer centers, and the like are considered to be attractive market entry prospects for fuel cells. One mode of this application would be a premium power configuration where the fuel cell dispatches a full 200 KW to the grid during normal periods, and reverts to a grid independent supply for local customer loads during any grid interruption.